by the testimony of the minor phonetic elements there was more method and arrangement in these than we can expect from a Maya — Indian — scribe, and for this reason the writer is prone to condemn his own work, yet repeated trials with the phonetic list arranged by him have given such good results that he is of the opinion that with careful research some good results may accrue that will be of value to students of Maya and its paleography.

It may be added, in conclusion, that the glyph known to Maya paleographers as that of "The God with the Old Man's Face," has been analyzed — its minor elements suggesting that it is that of Hoobuil-Kanil-Bacub. The suggestion given by the minor elements is "Ho-ka-n-ba-ka." The association of this glyph with "The Bee-Keeper's Narrative" of the Troano, lends a strong probability that the interpretation is a correct one, and that a former analysis attempted was erroneous.

This article is intended to be suggestive. The writer holds himself in readiness to modify any of the statements made, if the contrary be proven, or he finds in the progress of his researches that new evidence obtained proves former suggestions to be erroneous, thus only can we diminish the field of error and enlarge that of the truth.

Mexico, Jan. 31.

PRELIMINARY NOTE ON THE DISTRIBUTION OF PLACE-NAMES IN THE NORTHERN HIGHLANDS OF SCOTLAND.

BY JOHN GUNN, ACTING SECRETARY, ROYAL PHYSICAL SOCIETY.

NOTHING, at the present day, exhibits in a stronger light the effects of the Scandinavian occupation of the Northern Highlands of Scotland than the frequent occurrence of Norse place-names. And this, it must be remembered, in spite of the fact that the invaders were never permanently able to establish their own tongue as the language of the country, except in the Orkney and Shetland Islands (which form no part of the Highlands) and perhaps in certain areas in the Hebrides. The Celts have always had a wonderful power of assimilating to themselves alien races which come among them, and although subdued and ruled over by the vikings and their posterity down to the present time, caused their conquerors to adopt their language, dress, laws, and customs. Yet the number of places named by the Norsemen and still retaining these names is very remarkable.

As to general distribution, these names are more numerous along the coasts than inland. The vikings did not care to settle far from the sea, where impassable mountains and thick forests, inhabited by a warlike and hostile people, hindered convenient access to the sea. Thus as we retire from the sea-shore the place-names assume a more and more distinctly Celtic character. But even in places where the Scandinavian nomenclature more persistently prevails it is interesting to note how only the larger areas and more striking features of the landscape bear Scandinavian names. A parish, with its streams, estates, local districts, and large farms may bear names derived from the Norse, but those of crofts, burns, pools in the rivers, boulders, etc., have, as a general rule, purely Gaelic designations, many of them, doubtless, dating from a much later period than that of the Norse occupation. In this connection it is somewhat curious to observe how few mountains bear Scandinavian designations; forming bold features in the scenery, most of them must have been well known to the vikings, whose names, if they ever named many of them, have come down to us in so very few instances.

Good examples of the facts above stated may be gleaned from the topography of the county of Caithness, as there the vikings found a surer and more permanent footing than on any other part of the mainland of Scotland. The name, Caithness, is itself compound, but was undoubtedly given by the Scandinavians, and signifies "the headland of the Calaibh," the last-mentioned word being the name of the Celtic tribe which owned the district, and resisted, although unavailingly, the invasion and partial conquest of their ancient possessions. Caithness is divided into ten civil parishes, viz., Thurso, Olrig, Dunnet, Canisbay, Bowes, Wick, Watten, Halkirk, Latheron, and Reay. All these are of Norse origin except the two last mentioned, and all, with the exception of Halkirk, have sea-coasts. Latheron and Reay are Gaelic, and these districts, along with the western portion of Halkirk, were the places in which the aborigines were left to dwell in comparative peace. Yet here, all along the coasts, we find numerous Norse derivatives, such as Skail, Lylester, Forse (occurring also in the form Forso), Berriedale, and many others. In the western Halkirk area, which lies far from the sea, we can only remember two Norse names, viz., Glutt and Rumsdale. In the Scandinavian area, however, we discover the aboriginal element to be remarkably strong. The Gael was, and is, naturally facile in topography, and gave a name to almost every object, natural and artificial, which came under his notice in a fairly permanent form. A constant pool of water, a boulder of peculiar color or somewhat uncommon shape or size, a corner of waste land, a ditch — all were named. He frequently added a word from his own vocabulary to a Scandinavian root, using oftenest *Ach* (a field) or *Bal* (a town or farm) in this connection. Thus, we get such compound forms as Achalipster, Achkipster, in which examples we have, in conjunction, the Gaelic *ach* and the Scandinavian *ster*, both words having the same meaning, and making the names tautological.

These remarks are merely intended as an introduction to a more particular examination of a subject of particular interest and of sufficient importance to have induced Sir Charles Wilson, Director of the Ordnance Survey, to request the coöperation of the Scottish Geographical Society in revising the place-names for new issues of the Survey maps. The council of the society thereupon nominated a committee to undertake the work; and this committee, under the presidency of Dr. James Burgess, C.I.E., is now engaged in an examination of all the place-names in the Highlands, and, where there is any doubt, authoritatively fixing the correct form of spelling.

NOTE UPON THE ABSORPTION OF SULPHUR BY CHARCOAL.

BY WILLIAM P. BLAKE, SHULLSBURG, WISCONSIN.

IN tearing down some heaps of pyritic zinc ores, where heap-roasting to expel the sulphur from the pyrite had been attempted, a part of the wood used as fuel was found at the bottom of the heap not only carbonized, but portions of it, such as small limbs of trees, and looking like ordinary charcoal, were saturated with sulphur. The original form of the wood and its structure, its grain-rings of growth, bark, etc., seemed to be perfectly retained, but the weight and solidity of the masses at once showed that some change had taken place, and this change it was easy to prove was due to the presence of a large amount of sulphur penetrating every part.

The fragments of this sulphurized carbon are hard and brittle, and break most readily at right-angles to the length of the original tree-limbs. The color is very nearly that of ordinary charcoal, but lacks the lustrous black, having instead a grayish-black shade, and when the compound is cut or scratched with a knife, it exhibits a sub-metallic lustre. Specific gravity 1.60.

In the May number of the *American Journal of Science* Professor W. G. Mixter [1] describes the deportment of charcoal with the halogens, nitrogen, sulphur, and oxygen. He points out the extreme difficulty in obtaining fairly pure amorphous carbon, it so tenaciously holds such elements either occluded in its pores or in combination. His experiments were conducted upon three varieties of amorphous carbon, viz., sugar charcoal, lamp-black, and gas carbon. He found that charcoal after exposure to chlorine retains a considerable quantity at high temperatures; one experiment upon heated lamp-black showing an absorption and retention of from 14.3 to 15.5 per cent, while gas carbon, ignited in chlorine and allowed to cool in a current of dry nitrogen, failed to absorb chlorine. He concurs with other recent writers on this subject that carbon and chlorine do not unite directly, but states that chlorine does combine with carbon at high temperatures when hydrogen is present in the carbon, the hydrogen being apparently replaced by chlorine; for, while gas

[1] Amer. Jour. Sci., Third Series, xlv., No. 269, May, 1893, p. 363.

carbon containing 0.035 per cent of hydrogen does not take up chlorine, sugar charcoal, with 0.07 per cent, does take it up.

The experiments with charcoal and sulphur showed the absorption of from 20 to nearly 47 per cent in charcoal containing much hydrogen and oxygen, while nearly pure amorphous carbon takes up but little sulphur. Professor Mixter regards the sulphur as chemically combined with the carbon, in his experiments, and cites Berzelius in support of this view.

THE EARTH AS AN ELECTRICAL CONDUCTOR.

BY A. F. MCKISSICK, ALABAMA POLYTECHNIC INSTITUTE, AUBURN, ALA.

STEINHILL, at Munich in 1837, was the first to discover that the earth might be used instead of a return wire, contact being made to the earth at the two ends by means of metal plates sunk in the ground. He discovered this while experimenting on the Nürnberg-Fürther railroad for the purpose of determining whether the track could be used for telegraphic purposes. He noticed that the current passed from one rail to the other and the idea to use the ground as a return circuit occurred to him, which he afterwards found to be perfectly feasible. The earth is almost universally used as the return circuit in telephone and telegraph lines. While it is true that in the former a complete metallic circuit is sometimes found, it is not on account of the failure of the earth to conduct the current but for the purpose of diminishing the induction, caused by the presence of electric light and power circuits.

The earth-plates are made of zinc or copper and are sunk in moist earth, in a spring, or in the bed of a river. It has been generally considered that the earth offers no resistance at all as its cross-section is so large, although its specific resistance may be very high. While the resistance of the earth may be neglected when we have to deal with telephone and telegraph circuits, we must consider its resistance when it is to be used for conducting currents of large volume.

The element of danger to life and property forbids its use as a return in commercial lighting and motor circuits.

In street railway circuits, however, the earth is used partly as a return. It has been found that the earth alone, as a general rule, offers too much resistance, so that it is now almost the universal custom to use in connection with the earth the rails bonded together and also a bare copper wire. I had occasion during the past year to notice very closely this resistance in installing a motor at the experiment station of the A. and M. College of Alabama. I had expected to use the earth as a return, but owing to the very high resistance had to abandon this idea. It was with the idea of finding out how much the resistance of the earth near this motor was, that the following experiments were made.

An earth-pit was dug six feet deep, eight feet long, and two feet wide, at each end of the line running from generator at college to motor at experiment station. This line is by measurement three thousand feet long. A plate of copper, seven by two feet, and a plate of tin of same dimensions, soldered to a No. 0000 B and S wire were used as the earth-plate at each end. The plates were packed firmly with charcoal and iron filings and the pit filled with old iron. The water rose in one of the pits to a depth of two feet. With all connections soldered, the resistance measured by a Wheatstone bridge was found to be 102 ohms. Supposing the earth connection was not a good one at each end of the line, an additional earth connection at each end was made by sinking a large piece of iron in a well. With this additional connection there was no appreciable difference in the resistance. Connections to the earth were then made at different distances from the college by connecting one end of a wire to the overhead wire, the other end soldered and tied to a piece of iron six feet long, driven down flush with the ground. These distances were respectively 500, 1,000, 1,500, 2,000, and 2,500 feet from the college. These connections were made at different times, always removing an earth connection when its resistance had been measured. The resistances in the same order were 307, 567, 153, 707, and 217 ohms. The comparatively small resistances of stations 3 and 5 are probably explained by the fact that they were located near branches (small streams).

From these results we may conclude that the resistance of the earth is a very unknown quantity, and the assumption that the resistance of the earth can be neglected in any soil is an unsafe one when the object in view is to transmit currents without very much loss.

A VALUABLE FLORIDA DEPOSIT.

BY THOS. R. BAKER, PH.D.

THERE occurs near Bartow, Fla., and at other points as far south as Haines City a geological deposit which has recently been found to be very valuable as a material for covering the sandy side-walks and streets of Florida towns. It is popularly known in South Florida by the name "clay," but consists essentially of sand, clay, and oxide of iron, the proportions of which, determined by chemical analysis, are given in the following table:—

	Per cent.
Moisture	4.20
Silica	69 03
Aluminum silicate	18.21
Iron oxide	8.53
Calcium carbonate	Trace.

Geologically considered, the deposit is a sandstone rock, and, although it has to be quarried from its bed, it almost completely disintegrates in the quarrying, and needs no further preparation to fit it for the use to which it is applied. It is of a reddish color, due to the presence of oxide of iron.

The material is simply spread over the side-walk or street to which it is to be applied to the depth of several inches, and then sprinkled with water, and rolled with a heavy roller. After being walked upon and driven over for a short time it becomes very compact, and fully as hard as it is in its native bed.

The most valuable constituent of this material, when used as a covering for roads, is undoubtedly the oxide of iron, which acts as a cement, rendering the material capable of becoming compact and hard. That the iron serves this purpose was verified by removing it from the compound, and subjecting the mixture of the remaining constituents to tests that had been applied to the original material.

The adaptation of this deposit to the improvement of roads was first brought to notice by the South Florida and other railroad companies, who used it for the improvement of railroad crossings, drive-ways about stations, etc., and the first extensive use made of it for streets and side-walks was by the city of Orlando about a year ago. It has given excellent satisfaction in Orlando, nothing having been done for the place for years that has so improved it. It has been the means of converting streets so sandy that travel over them was very slow and difficult into drive-ways over which travel is easy and pleasant. Now, on Orlando streets, vehicles and horses' hoofs have the familiar rattle and thud that are heard when driving over a macadamized road. It is the opinion of those who have studied the subject that geological deposits like the one here described are of very rare occurrence.

NOTES AND NEWS.

THE next meeting of the Australian Association for the Advancement of Science will be held in Adelaide, South Australia, commencing on September 25th, 1893. The meeting in Adelaide will be presided over by Ralph Tate, F.L.S., F.G.S., professor of natural science at the University of Adelaide. At the time fixed for the meeting, South Australia will be at its best. There is no better time at which to visit Australia than when spring is merging into summer. To naturalists, this time of year is specially attractive, and these may be reminded that at the meeting of the Association they will come into contact with men of like tastes from all parts of Australia. Should visitors wish to prolong their trip, they will do well to visit during the months of October and November the principal objects of interest in the mainland, and in December, January, and February to pass on to New Zealand and Tasmania.